REMARKS

Please consider the following Applicants' response to the outstanding rejection of July 26, 2005.

The Prior Art

The prior art: US 4,908,240 Auhorn et al (Auhorn); US 6,171,381 Yoshimura et al (Yoshimura).

The Rejection

Claims 20, 24-26, 29 and 31-34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Auhorn in view of Yoshimura.

The Examiner's position on the prior art is set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

Traversal

Applicants rely upon the DECLARATION...1.132 of Yoshiyuko Kondo filed in USSN 09/982,770 which is of record (the Declaration).

Claim 20 of the present application reads as follows:

20. (currently amended): A method for sizing a paper with a sizing agent which comprises coating or impregnating a raw paper with a sizing agent consisting essentially of a water-soluble soybean polysaccharide, a cationic polymer and a surfactant, whereby when said paper is subjected to inkjet printing, ink attached to a paper surface quickly penetrates into the inside of the paper while suppressing ink dots formed by ink drops on a paper surface from spreading.

Major distinguished features of the claimed invention are:

(1) the use of a sizing agent where one coats or impregnates a raw paper with a sizing agent consisting essentially of a water-soluble soybean polysaccharide, a cationic polymer and a surfactant: and

(2) as a result, when the resultant paper is subjected to inkjet printing, ink attached to a paper surface quickly penetrates into the inside of the paper while suppressing ink dots formed by ink drops on a paper surface from spreading.

The above statements are supported by the Declaration which demonstrate the unexpected features of the method of the present invention based on the use, *inter alia*, of the water-soluble soybean polysaccharide of the present invention as compared to an aqueous coating agent made in accordance with Example 2 of Auhorn with respect to paper sizing.

Auhorn discloses a process for improving the printability of paper by applying an aqueous coating agent consisting of pigments and binders to one or both surfaces of the Auhorn paper and drying the coated paper, the aqueous coating agent or mixture consisting of:

(a) 100 parts by weight of a finely divided pigment,

(b) from 5 to 70 parts by weight, based on polymer, of a cationic aqueous polymer dispersion of a paper size, where the cationic aqueous polymer has a glass transition temperature of 5° to 80°C, and

(c) from 0.01 to 10 parts by weight of a surfactant which interferes with the formation of the surface size, and/or of a polymeric dispersant

is used as the coating agent in an amount of 4 g/m^2 (Auhorn at column 1, line 65 to column 2, line 12).

Auhorn also discloses that up to 90%, preferably, 5 to 30% by weight of the polymer component (b), can be replaced by a water-soluble polysaccharide (Auhorn at column 2, lines 12-14). Applicants believe Auhorn in fact actually teaches that suitable polysaccharides are water-soluble starches, carboxymethylcellulose, methylcellulose, hydroxymethylcellulose and galacomannanes (Auhorn at column 7, lines 26-29). Auhorn fails to teach or suggest the use of water-soluble soybean polysaccharide extracted from soybean as a water-soluble polysaccharide.

Applicants carried out comparative experiments to demonstrate the unexpected differences between a sizing agent comprising the water-soluble soybean polysaccharide of the present invention and an aqueous coating agent made per Example 2 in Table of Auhorn in fixing and color development of ink on a paper surface as shown in Table 1 below to obtain the results as shown in Table 2 below. This is taken from the Declaration of record.

Table 1

Composition of Sizing Agent (parts by weight on a solid basis)

RUN No.	1(7)[*1)]	2[*2)]
China Clay[(1)]	--	100
Na Salt of Polyacrylic Acid[(2)]	--	0.5
Water-Soluble Soybean Polysaccharide[(3)]	1.2	--
Cationic Polymer[(4)]	1.2	--
Digested Cationic Starch	--	--
Cationic Dispersion 2[(5)]	--	33.3 +6.7

Alumina(6)	0.6	--
Surfactant(7)	0.3	--
Total of Solid Components	3.3	140.5
Solid Component Used in an Aqueous Solution	3.3	2.0
Water	96.7	98.0

Note:

(*1) EXAMPLE, which corresponds to EXAMPLE No. 7 in Table 1 of the specification.

(*2) COMPARATIVE EXAMPLE disclosed in the cited reference US Patent 4,908,204 to Auhorn et al, Example 2 in Table 2.

(1) Tradename "AA Kaolin," available from Fuji Talc Ind., Ltd.

(2) Tradename "ARON T-40; Available from Toagosei Co. Ltd.

(3) Tradename "Soyafive S-DN," available from Fuji Oil Co., Ltd.

(4) Viscous cationic polymer obtained by polymerizing a mixture of 70 parts by weight of N,N-dimethylaminoethyl acrylate•methyl chloride and 30 parts by weight of dimethyl acrylamide in a 15% concentration.

(5) Prepared by the procedure described at column 10, lines 30-49 of US'240.

(6) Easily sinterable, low-sodium alumina (Tradename "AES-12," available from Sumitomo Chemical Co., Ltd.).

(7) Nonyl phenol ("Brownon N-509," HLB of 12.8 available from Aoki Oil Industrial Co., Ltd.)

Table 2 Results of Evaluation

No.	Color Development of Ink				Water Resistance
	Red	Yellow	Blue	Black	
EXAMPLE (A)*1) (RUN No. 1)	1.139	0.913	1.146	1.322	◎
COMP. EX (B)*2) (RUN No. 2)	1.117	0.856	1.104	1.460	X

With respect to Example 2 of Auhorn, the composition used in the comparative experiments was 100g of China clay, 0.5g of the Na salt of polyacrylic acid, 6.7g of Digested cationic starch and 33.3g of Cationic dispersion, which was prepared by the procedure stated in **Cationic dispersion 2** (carrying out polymerization in an aqueous solution of aqueous cationic potato starch) at column 10 of Auhorn.

In contrast to Auhorn, the composition of the present invention used in the comparative example corresponded to EXAMPLE No. 7 in Table 1 of the specification, that is, 1.2g of Water-soluble soybean polysaccharide, 1.2g of Cationic polymer, 0.6g of Alumina and 0.3g of Surfactant.

With respect to the cationic aqueous polymer of Auhorn, the polymer is a typical cationic surface size so that the polymer functions to size a paper without the use of a water-soluble polysaccharide (see Auhorn at column 2, lines 14-15 and lines 46-48). As a result, the Auhorn aqueous coating agent comprising a **cationic aqueous polymer dispersion** of a paper size per Auhorn produces the effects of improving the printability of raw paper, which is an uncoated and

unbleached paper having uniform ink receptivity and is very smooth, and is used for newspapers, illustrated periodicals and advertising brochures so as to increase properties such as opacity, strike-through, translucence, whiteness and brightness (see Auhorn at column 2, lines 17-32).

In the composition of Auhorn, the Na salt of polyacrylic acid presumably does not act as a paper size, since it is a thickener. Further, China clay is an inorganic colorant (pigment). Accordingly, the elements which influence sizing are the digested cationic starch and the cationic dispersion of Auhorn.

In contrast to the above composition of Auhorn, the composition of the present invention used in the comparative example corresponds to EXAMPLE No. 7 in Table 1 of the specification, that is, 1.2g of Water-soluble soybean polysaccharide, 1.2g of Cationic polymer, 0.6g of Alumina and 0.3g of Surfactant.

With respect to the composition of the present invention, the elements which influence sizing are the water-soluble soybean polysaccharide and the cationic polymer.

As is clear from Table 2 above, in EXAMPLE (A) coated using the sizing agent of the present invention, the water resistance was greatly improved from that in COMPARATIVE EXAMPLE (B) coated using the aqueous coating agent of Auhorn. The unexpectedly advantageous features of the sizing agent using the water-soluble soybean polysaccharide of the present invention over that of the aqueous coating agent of Auhorn in water resistance can be found by comparing the backside surfaces of both printed-papers (A) and (B). In the backside surface of the printed-paper (A), no ink blurring is observed.

Applicants appreciate that the copies that the Examiner has do not show the backside surface so that no blurring of ink can be seen. However, it might be possible for the undersigned to obtain copies from the file wrapper of USSN 09/982,770 if the Examiner wishes. It is believed this can be done. In Applicants' view, the unexpected benefits with respect to water resistance of the sizing agent of the present invention over the aqueous coating solution formed per Example 2 of Auhorn are due to the effect of the water-soybean polysaccharide of the present invention.

As is clear from the TABLE at columns 11 and 12 of Auhorn, the lower the Cobb value and the higher the ink flotation time the more effective is the size. Specifically with respect to the TABLE, the TABLE teaches that the result of sizing Example 2 is 0 and in Comparative Example 1 is 40 (not zero), while the result of ink floatation time (50% strike-through) Cobb (60 sec.) for Example 2 is 53 whereas for Comparative Example 1 it is 23.

This means that the lower the sizing value and the higher the ink flotation time, the more effective is the size. That is, the value of ink floatation time is a measure showing the absorbability of water for the treatment paper (see other values of ink flotation time shown in Table of Auhorn). In Auhorn, since the surface sizing test seems to have been carried out according to the Cobb water absorption test for 30 seconds (Cobb. Sub. 30 WA) as described in DIN 53,132 (see column 10, lines 15-17 of Auhorn), it seems that considering the result of sizing in Comparative Example 1, the surface sizing of the treated paper used in Auhorn resulted in very high (complete) adsorption of water.

Applicants thus respectfully submit that one of ordinary skill in the art, referring to Auhorn, who fails to teach or suggest with any specificity the use of a water-soluble soybean polysaccharide, would not be motivated to reach the invention of claim 20.

However, the rejection is a combination rejection, and Applicants now turn to Yoshimura.

Yoshimura discloses an aqueous metallic ink composition comprising at least a metallic powder pigment, a colorant, water and a water-soluble organic solvent, which further may include both a natural polysaccharide and a water-soluble soy polysaccharide or a water-soluble polysaccharide derivative, whereby the stability with time of the density of color development is increased, and changes in the viscosity of the ink after storage are restrained or prevented (see Yoshimura at column 3, lines 48-61).

Specifically, in Yoshimura, a water-soluble soy polysaccharide or a water-soluble soy polysaccharide derivative is used in place of either a cellulose derivative such as methyl cellulose, CMC, etc., or a cyclodextrin/cyclodextrin derivative, both of which have hydroxyl groups, together with a natural polysaccharide (see Yoshimura at column 2, line 64 to column 3, line 11, column 3, line 46 to column 4, line 19, column 5, lines 40-54, and column 6, lines 15-34). However, an **indispensable component** for controlling color development in the aqueous ink composition of Yoshimura is not the water-soluble soy polysaccharide or the water-soluble soy polysaccharide derivatives but a **natural polysaccharide**. This means that the water-soluble soy polysaccharide or the water-soluble polysaccharide derivative of Yoshimura cannot be used independently, but must be used together with a natural polysaccharide selected from the group

consisting of a microbial polysaccharide or a derivative thereof, water-soluble vegetable polysaccharide or a derivative thereof, or a water-soluble animal polysaccharide or a derivative thereof (see column 4, lines 59-63 of Yoshimura).

Further, in order to maintain the viscosity of the ink for an extended period of time, the aqueous metallic ink composition of Yoshimura is preferably adjusted in pH to a value within the range of from 8.0 to 10, in addition to using an **anionic polymer** not only for improving dispersion stability by preventing the aggregation of pigment contained in the ink and to assist in the formation of the ink film but also to maintain the stability of the metallic powder pigment for an extended period of time (see column 10, line 66 to column 11, line 2; column 13, line 65 to column 14, line 3 of Yoshimura).

It is believed that the primary characteristics of a Yoshimura system would be affected by the fact that the water-soluble soy polysaccharide or water-soluble polysaccharide derivative easily absorb to or might be easily absorbed in ink or absorb ink due to hydrogen bonding to the surface of the metallic powder pigment and the surface of the colorant (pigment), whereby the water soluble soy polysaccharide or water-soluble soy polysaccharide derivative attaches the colorant to the metallic powder pigment. This mechanism is explained at column 4, lines 7-13 of Yoshimura.

In distinction, in accordance with the present invention, and as recited in claim 20, a surfactant is an essential element. The surfactant functions to improve the water resistance of an image in combination with the water-soluble soybean polysaccharide by insolubilizing a dye based on the following reaction mechanism as shown in Fig. 2:

(1) as the hydrophobic group in side chains of the water-soluble soybean polysaccharide has affinity for a hydrophobic portion of the surfactant, the surfactant attaches to the side chains of the water-soluble soybean polysaccharide such that the hydrophilic portion of the surfactant protrudes outward (see Fig. 2(a));

(2) because the hydrophilic portion of the surfactant becomes close to hydrophilic portion of the dye contained in the ink, the dye also becomes close to or attracted to the water-soluble soybean polysaccharide (see Fig. 2 (b)); and

(3) as a result, dye is attracted to the **cationic** polymer pseudo-cross-linked with the water-soluble soybean polysaccharide, whereby the dye is insolubilized due to the bonding of the cationic portion of the cationic polymer and the anionic portion of the dye (Fig. 2 (c)), i.e., the cationic polymer plays a very important role in insolubilizing the dye.

Applicants believe it will be quite clear from the above that both the water-soluble soybean polysaccharide and the cationic polymer play extremely important roles in solubilizing the dye, a basic mechanism or factor which is completely different from the role of the water-soluble soy polysaccharide or water-soluble soy polysaccharide derivative/anionic polymer combination of Yoshimura in maintaining the viscosity of an ink at a desired level.

Applicants respectfully submit that Yoshimura, which does not teach or suggest using a sizing agent to coat or impregnate a raw paper with the sizing agent consisting essentially of a water-soluble soybean polysaccharide, a cationic polymer and a surfactant, would not motivate one of ordinary skill in the art to modify Auhorn in view of the teaching of Yoshimura, or vice

versa, and certainly this is the case considering the basic difference in mechanism or effect desired between Yoshimura, Auhorn and the present invention.

Considering all of the above, withdrawal of the rejection over Auhorn in view of Yoshimura and allowance of all claims is requested.

Respectfully submitted,

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23373
CUSTOMER NUMBER

Date: October 26, 2005